

WHITE PAPER

# **BUILDING SUSTAINABLE CAPACITY FOR CLIMATE ACTION IN AFRICA**

**THE ROLE OF THE NDC SUPPORT CENTER**





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The views expressed in this publication are solely those of the authors.



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***“Commitments to net zero are worth zero without the plans,  
policies and actions to back it up.”***

UN Secretary-General António Guterres <sup>1</sup>

# 1

## Introduction

December 2015. COP 21. The Paris Agreement – adopted then and there by 196 parties to the United Nations Framework Convention on Climate Change (UNFCCC) – stood as a milestone in the multilateral climate change process: for the first time, a binding agreement brought all nations together in common cause to commit to combating climate change through the pursuit of reaching a net-zero emissions <sup>2</sup> target.

However, here we are, almost a decade later, and – according to the Intergovernmental Panel on Climate Change (IPCC) – global warming will continue to rise in the near future (2021–2040), mainly due to increased cumulative greenhouse gas (GHG) emissions.

Which seamlessly brings us to the relevance of the above quote by UN Secretary-General António Guterres: with continued emissions affecting all major climate system components, government actions at sub-national, national, and international level – backed by both civil society and the private sector – more than ever have a crucial role to play in enabling and accelerating shifts in the development of pathways towards sustainability and climate resilient development.

Fortunately, the rising level of ambition is and will continue to be supported by the UNFCCC, the Kyoto Protocol, and the Paris Agreement, with at its core the Nationally Determined Contributions (NDCs) introduced in 2015: national climate plans that highlight policy development and target setting at the national and sub-national levels, with greater transparency in climate action and support as a result.

Now, as laudable and necessary as NDCs may be, in practice they don't come without their own set of challenges – especially when it comes to developing countries.

Firstly, they cover a wide range of sectors, which means that developing national inventories and designing mitigation strategies requires considerable statistical and analytical expertise across government agencies.

As a result, statistics depend widely on estimation due to unavailability of high quality and robust data. In addition, core modeling and analytical work often has to be outsourced to foreign experts due to the level of complexity involved. This appears to be the case for many African countries, which lack the expertise mentioned above. Although many initiatives have been taken to address this capacity issue, challenges remain due to even broader issues such as further financial and technological constraints – highlighting the importance of international cooperation and a different approach to capacity building.

<sup>1</sup> UN Secretary-General message during the release of the UN Environment Programme (UNEP) Emission Gap Report 2022. Nairobi, 27 October 2022.

<sup>2</sup> IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001



Indeed, current capacity building doesn't seem to be tailored to the challenges at hand: it tends to rely on narrow programs designed for specific institutional bodies, to offer short-term training rather than long-term support, to promote one-size-fits-all solutions that don't fit all, to lack a thorough understanding of data capacity, and to focus mainly on the modeling tools rather than on how to use the underlying models to design fair and efficient climate policies.

Against this backdrop, the African Energy Commission (AFREC) and VITO joined forces to secure funding from the Government of Flanders to establish the NDC Support Center – a joint effort to address the challenges at hand and fill the current gap in African capacity-building programs.

Thus, since 2021, the NDC Support Center has been playing a critical role in enabling African Union Member States to navigate the complexities of climate policy in general and the energy sector in particular.

As such, in addition to providing technical and financial support, the NDC Support Center – through the tailored approach of its Pilot Program – has so far been helping four African countries (Malawi, Morocco, Mozambique and Uganda) to build their capacity to produce accurate data and build capacity to develop and implement climate change mitigation models and policies that are aligned with national energy sector priorities.

Given the Pilot Program's proven success in establishing improved governance processes for NDC reporting under their respective Paris Agreement commitments, the time has now come to put pen to paper to share our overall findings and insights, and highlight our key results and best practices from three years of implementation in the four African Union Member States.



*Group picture of Uganda experts during the first in-country workshop in Entebbe.*

## 2

# Nationally Determined Contributions (NDCs): Their Ins and Outs Highlighted

### 2.1 Understanding NDCs

At the 21st session of the Conference of the Parties (COP) in Paris, 196 nations reached an agreement to limit global warming to well below 2°C above pre-industrial levels, with efforts to cap the increase at 1.5°C. As part of the agreement, the framework for Nationally Determined Contributions (NDCs) was established as a specific document outlining countries' climate goals and strategies.

Developed in five-year cycles, NDCs are submitted to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) to facilitate monitoring and implementation. Together, these climate actions will determine whether the world meets the long-term goals of the Paris Agreement, reaches a global peak in greenhouse gas (GHG) emissions, and then begins rapid GHG emission reductions as soon as possible. By the second half of the century, it should be possible to achieve a balance between anthropogenic emissions and removals by sinks.

### 2.2 Equity and Development Priorities in Emissions Reductions

The process of peaking emissions will take longer for developing countries. Emission reductions will be guided by equity as well as sustainable development and poverty eradication, which are key development priorities for many developing countries.

The Paris Agreement's transparency framework is critical to fostering mutual trust among nations, with national greenhouse gas inventories and comprehensive strategies serving as critical components for monitoring the progress and implementation of NDCs.

### 2.3 Challenges and Implementation in African Union Member States

As part of their commitment to mitigation and adaptation, most African Union Member States have ratified the Paris Agreement and are implementing their NDCs. However, the preparation of these documents poses significant challenges due to the required institutional capacity and frameworks. As NDCs cover a wide range of sectors, the preparation of national inventories and the development of mitigation strategies require significant statistical and analytical expertise across all government ministries and departments. In many cases, due to the complexity of NDC strategy planning and modeling, core modeling and analytical work is outsourced to foreign experts, particularly in contexts where domestic institutional and academic capacity is insufficient.

These challenges reflect broader issues faced by developing countries, including financial constraints and technological limitations, which affect the quality of NDCs reporting and hence implementation of NDCs. This highlights the need for international cooperation and capacity building.

# 3

## Developing NDCs: What Barriers are African Union Member States Facing?

Africa faces the dual challenge of meeting its Paris Agreement commitments and achieving economic growth. Africa's NDC implementation is mainly hindered by funding constraints, among other development challenges:

### 3.1 Need for increased Academic Capacity and Knowledge Sharing with Policymakers

Modeling of energy systems and greenhouse gas (GHG) emissions in developed countries is typically led by research institutions or academics with strong ties to policymakers. In contrast, African Union Member States experience insufficient capacity to develop science-based plans and policies, particularly in the areas of energy systems and economics. It has been identified that national institutions responsible for NDCs lack modelling capability.

This discrepancy results in policymakers being disconnected from academic research, limiting the practical application of valuable insights generated by academia in policymaking. **Addressing this need for increased academic capacity and facilitating knowledge exchange between academia and policymakers is seen as a major challenge in African Union Member States, requiring significant investment and time to foster effective relationships between the two sectors.**

### 3.2 Limited Policy Coordination and Alignment

Government ministries often develop and use plans and models independently, with little sharing of data, knowledge, or methodologies. Most African National Plans for relevant sectors do not mention developed NDCs. **This fragmented approach hinders progress toward climate and energy goals by preventing comprehensive planning and coordination across sectors.**

To address these challenges, relevant bodies must develop a common understanding and commitment to foster more effective collaboration and knowledge exchange. **Lack of capacity often requires countries to seek international support to develop NDCs.**

### 3.3 Reliance on External Technical Capacity and Expertise

Climate plans in African Union Member States are often hampered by outsourcing the design of NDC strategies to external experts who may lack a nuanced understanding of local realities, relying instead on expertise developed in a different geographical context. **Some solutions that have proven effective elsewhere may not be suitable for Africa's diverse contexts, leading to proposals for impractical solutions that go unchallenged due to limited analytical capacity within national bodies.**

This disconnection from the realities on-the-ground undermines policymakers' confidence in implementing NDC strategies, leading to unsustainable follow-up. In addition, the complex and confidential nature of consultancy work can make it difficult to locate, reuse, and verify. NDCs may be subject to ownership issues in many cases. Furthermore, conducting thorough due diligence on the soundness and scientific work of consultants is challenging due to a lack of local capacity to understand, verify, and criticize these models. **As a result, nations continue to rely heavily on the work of consultants, perpetuating a cycle of dependency.**

### 3.4 Inaccessible and Poor-Quality Data

Data quality is essential for accurate modeling of NDCs. Lack of reliable and sufficient data is a major barrier to effective science-based planning in many African Union Member States. Data availability and accuracy is further complicated by the informal economy. Although national bodies such as the National Statistical Office and various sectoral ministries should produce, update, and communicate data transparently, capacity constraints make this difficult. Even when data are available, they may not be communicated effectively or in a format suitable for data-driven policy development and implementation. **As a result, modeling efforts are less reliable and effective without data coordination and accessibility.**

The need for enhanced capacity in many African Union Member States has led to a call for support to help them submit their NDCs in the global fight against climate change.



# 4

## Africa's Capacity-Building Paradigm: Challenges and Opportunities

There has been a long history of capacity-building programs, including energy planning, in Africa. These programs have been designed to assist African Union Member States in building strong internal foundations to plan and design their future energy systems in a sustainable manner. However, capacity-building programs currently face several challenges that negatively impact their long-term effectiveness and require an improvement in the paradigm and philosophy of training programs. Addressing these challenges requires innovative approaches and new concepts that address the specific contextual realities of African countries, foster interdisciplinary collaboration, and prioritize local ownership and sustainability. **By improving the quality and relevance of capacity building initiatives, African countries can better navigate the complexities of climate action planning and contribute meaningfully to global climate change efforts.**

### 4.1 Tailoring Capacity-Building Programs to Specific Institutions

Capacity building programs are often tailored to specific audiences, such as academia or ministries. For example, in the case of Nationally Determined Contributions (NDCs), ministries of environment are often targeted as they oversee the preparation of NDCs. However, while environment ministries take the lead in preparing NDCs, climate policies often depend on collaboration with other ministries, such as the ministries of energy, land policies, agriculture, etc.

This approach risks limiting sustainable capacity and knowledge development, as expertise may remain trapped in siloed departments or within a small group of people. The sustainability of capacity-building and knowledge-sharing initiatives, whether on topics such as NDCs or energy system planning, depends heavily on inclusiveness within programs. It is essential to ensure broad dissemination of knowledge to all relevant government departments and organizations, as well as local centers of excellence.

### 4.2 Designing Training Relevant to Capacity-Building Needs

Capacity building and training events are often constrained by time and resources, resulting in short workshops that cover a variety of technical content.

This limited time frame can hinder the ability of participants to fully digest and understand the material. In addition, the focus on highly technical modeling tools can overshadow the development of the analytical skills needed to make meaningful use of these tools. The outputs of such trainings often lack clear links to long-term national challenges.

Modeling or statistical training sessions are often one-time events, which further reduces their impact because participants do not have the opportunity to apply and embed the knowledge in future training or to use it in a supported way on the job, hampering effectiveness.

### 4.3 Moving Beyond a One-size-fits-all Approach to Capacity Building

Each country has unique characteristics and challenges, making it difficult to design a one-size-fits-all approach to capacity building. However, the labor-intensive nature of training programs can lead institutions to adopt a standardized approach across countries, resulting in generic knowledge building with fictional case studies that may not be aligned with each country's specific circumstances.

### 4.4 Underestimating the Importance of Data

Many capacity-building programs prioritize training in modeling tools for climate policy planning, while overlooking data quality. Without adequate data, modeling tools produce unreliable outputs. This oversight is particularly evident in the energy sector, where it can have significant long-term implications for strategic energy planning.

Training initiatives should focus on understanding countries' data needs – including models, identifying gaps and developing sustainable solutions to build energy demand and supply statistics in the country. Training and support for energy statistics development needs to be long-term, practical and build cooperation and collaboration between government ministries and energy companies.



### 4.5 Focusing on Modeling Tools

Despite international efforts to build capacity for strategic planning in African countries, training has largely focused on the functionality of modeling tools rather than on how to use these tools to develop useful policy instruments (Figure 1). While critical, this focus may overlook other challenges that have been identified. Ensuring ownership of modeling tasks within countries is essential for sustainable planning and policy design. However, the lack of existing or available academic capacity in the region may jeopardize this ownership, as there may be insufficient expertise to maintain and develop models in the future.

In addition, training on specific tools may lack basic knowledge of how models work and why, leading to superficial analyses. Long-term plans to build capacity in research institutes and universities are necessary for the effective use of modeling tools in science- and data-driven planning and policymaking, as reliance on outsourcing remains prevalent in many countries despite capacity-building efforts.

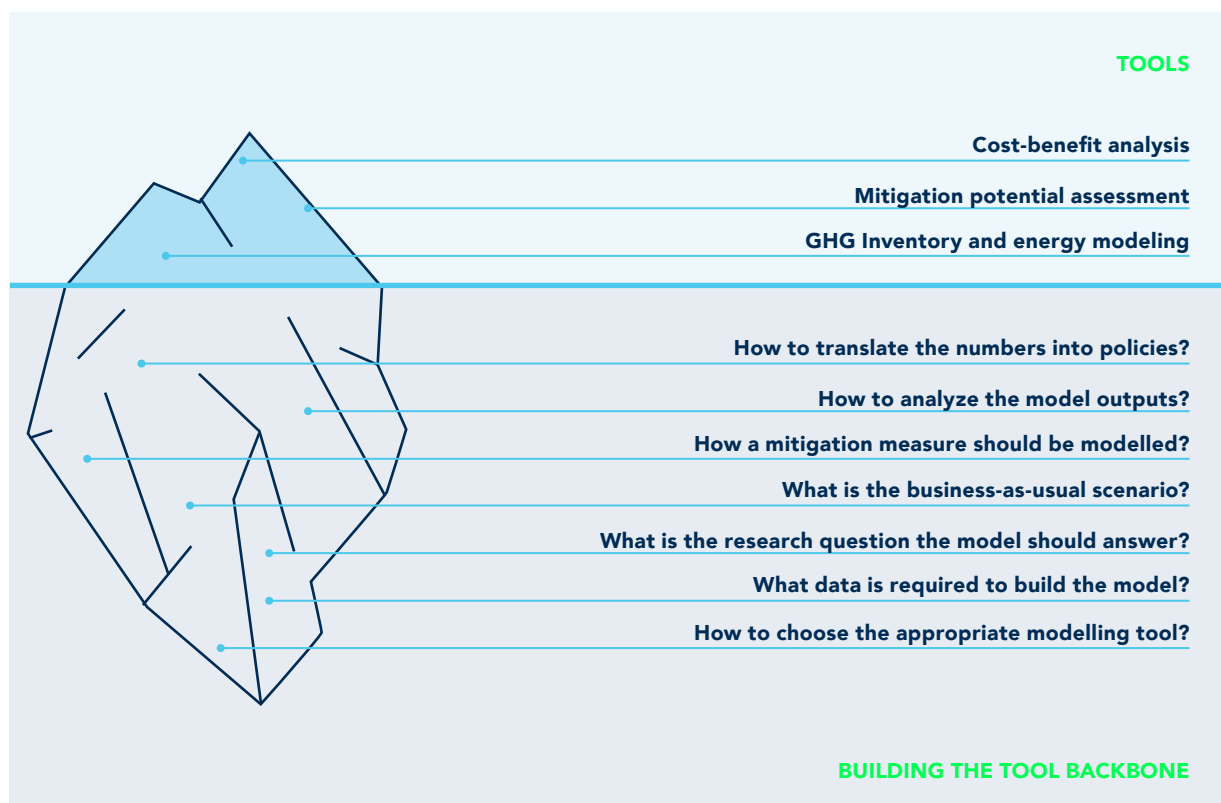


Figure 1 - While models are an essential part of the NDC preparation process, their development and use requires a high level of expertise, often involving very complex background knowledge.

Given these challenges and requirements, a new approach is essential. Through the **NDC Support Center Pilot Program**, VITO and AFREC have sought to provide this fresh approach through long-term, close collaboration with selected African Member States to address persistent challenges within the capacity-building paradigm in climate change mitigation planning.

While the primary focus of the Pilot Program has been on advancing NDC development in these countries, it has also placed significant emphasis on the energy sector as the vanguard of Africa’s future development – a key driver of a sustainable economy in line with global efforts to combat climate change.

# 5

## The NDC Support Center: Redesigning International Support for Developing Countries

### 5.1 A Successful Pilot Program

The NDC Support Center Pilot Program – funded by the Government of Flanders and implemented by AFREC and VITO – was launched to address the challenges mentioned previously and fill the existing gap in African capacity-building programs. Between 2021 and 2024, four African Union Member States have been successfully supported by this Pilot Program: Malawi, Morocco, Mozambique and Uganda.

The initiative introduced a new perspective and approach to global capacity building and support for African Union Member States – specifically targeting the energy transition challenges highlighted in previous sections.

To date, our engagement has spanned three to five years – ensuring long-term, continuous support to African Union Member States. The Center’s activities include providing technical and financial assistance, enabling countries to collect, validate and disseminate accurate, timely and updated data, and building capacity to develop and implement climate change mitigation models for the energy sector and policies aligned with national priorities (Figure 2).

Activities were proposed to partner countries through three work packages: (i) situational assessment (WP1), which includes a ‘National Action Plan’ with identified actions and prioritizations; (ii) improvement of sector statistics (WP2), which prepares the country energy and climate statistics digest; and climate and sector strategy modeling (WP3), which focuses on modeling and reporting of GHG emissions data (Figure 3).

The NDC Support Center recognizes the multi-level nature of climate action and aims to strengthen international/ regional organizations, national government stakeholders and local centers of excellence. Under direct national leadership, we work closely with designated ministries responsible for NDC and Long-Term Low-Emission Development Strategies (LT-LEDS) development. Through this approach, we aim to facilitate effective, sustainable, and locally-led climate action in African countries.

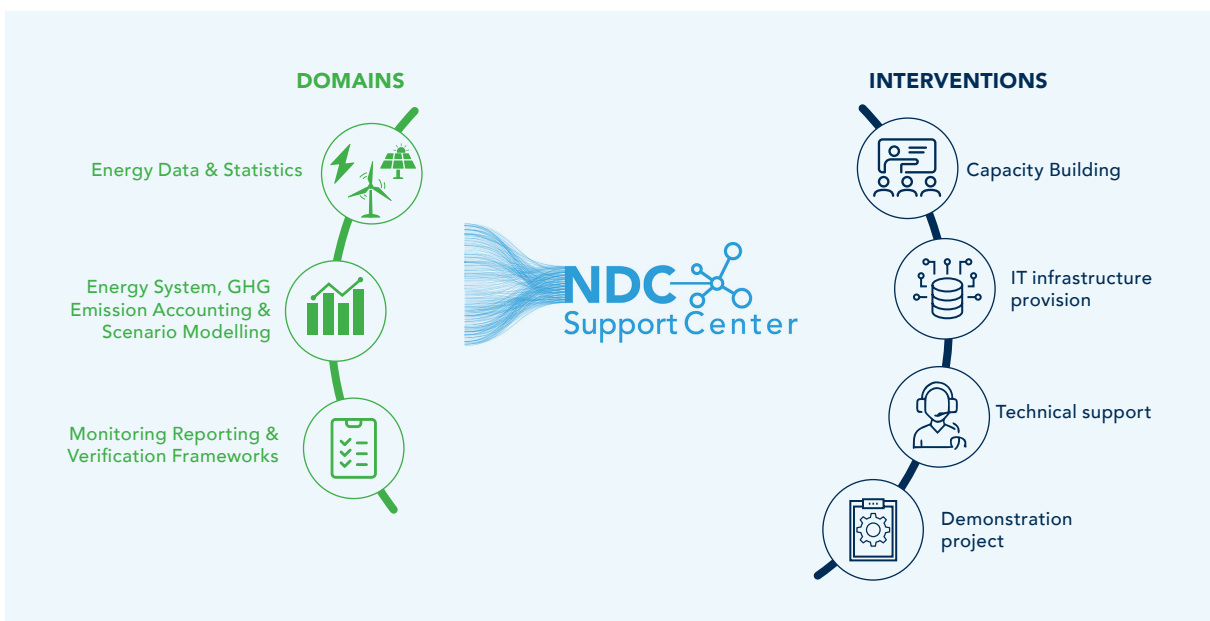


Figure 2 - The activities of the NDC SC are structured around three main domains and implemented through various interventions.

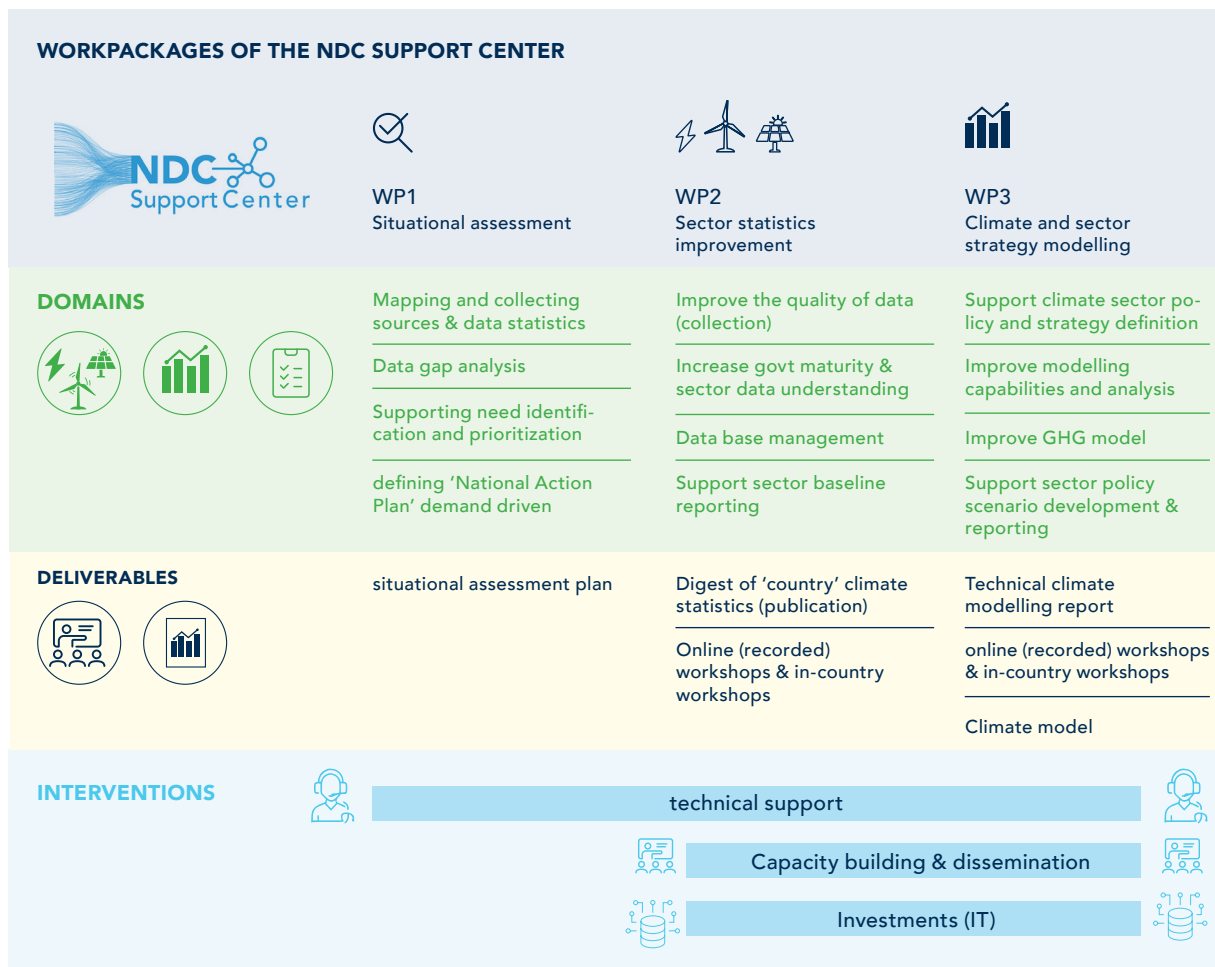


Figure 3 - The interventions of the NDCs in the three domains.

## 5.2 Long-Term Support for Sustainable Impact

Our approach to capacity building emphasizes the importance of long-term, continuous support to African Union Member States. Rather than providing sporadic training events, we extend our support over three to five years based on the situational assessment to ensure sustained engagement and support. Long-term support is essential for several reasons.

First, it allows for the gradual implementation of capacity-building initiatives, giving countries the time they need to fully understand and internalize the knowledge and skills provided. In addition, by spreading our efforts over time, we enable trainees to apply their learning to real-world challenges and issues, thereby fostering practical experience and expertise. In countries where capacity gaps are particularly severe, long-term support is even more critical.

By committing to sustained engagement, we instill confidence in trainees and senior ministry officials and assure them of ongoing support as they tackle complex challenges.

This continuity enables trainees to approach issues with greater confidence and resilience, knowing that support will be available throughout the project. In addition, our long-term approach fosters a learning-by-doing mentality, allowing trainees to apply their newly acquired knowledge and skills in real-world situations. The experiential learning process not only reinforces learning, but also enables trainees to develop practical solutions to real-world challenges.

**During the three years (2021-2024), the NDC Support Center provided 200 hours of online training and four times 30 hours of in-person workshops in Malawi and Uganda.**

### 5.3 Capacity Building through Co-Creation

Local collaboration is a critical element of capacity building programs for climate action planning in Africa. Given the interconnected nature of climate challenges, a multifaceted approach involving different stakeholders working together is essential. **Rather than transferring knowledge from external perspectives to beneficiaries, our approach prioritizes co-creation.** This involves a collaborative process in which participants actively contribute with their insights, experiences, and priorities to shape the content, methodologies, and outcomes of capacity-building activities.

The project’s modeling and reporting outputs are often co-created by participants with the support of project partners. By engaging stakeholders as co-creators, these programs not only enhance technical skills, but also foster a sense of ownership, commitment, and collective responsibility for advancing the climate change agenda in Africa.

During the first in-country workshop, participants selected the most relevant energy scenarios to explore. A recurring topic of discussion in the working group in Uganda was access to clean cooking solutions and biomass use.

Participants proposed several mitigation options, including distributing and subsidizing liquefied petroleum gas (LPG) cylinders to urban residents or implementing a special “cooking” tariff by lowering electric costs in homes compared to charcoal costs.

### 5.4 Energy Data and Statistics as a Key Issue

Energy data and statistics play a key role in enabling meaningful research and decision-making in the energy sector. Recognizing this importance, our approach places high priority on capacity building in this domain. Our capacity-building efforts include a range of activities aimed at improving the collection, management, analysis, and dissemination of energy data. To ensure that relevant and accurate information is collected, this includes training on where to find data, how to work together, and how to collect it through surveys. We also focus on enhancing the reliability and credibility of energy data sets by improving data quality measures.

**Strengthening energy data and statistics capacity provides a solid foundation for subsequent activities focused on energy system modeling for scenario analysis and mitigation planning.** Improved data availability and understanding will enable more robust and evidence-based modeling exercises, facilitating informed decision making and policy design.

Our work on energy statistics has been built up from where the country started. We have made full use of existing data – often from different ministries – and collected data from regulators and energy companies using AFREC’s standard questionnaires. This was supported by hands-on capacity-building training sessions that provided a foundation of knowledge about energy statistics and tools, in line with AFREC work on African Energy Information System (AEIS).



Uganda experts during the first in-country workshop in Entebbe.



The training sessions were also highly participatory, allowing participants to embed the knowledge by using their own country's data. In addition, we prioritized and provided long-term practical support for the development of country energy balances to provide a comprehensive overview of energy consumption, production, and distribution. **This enables stakeholders to gain insight into energy trends and patterns, and to make informed decisions.**

Our support for developing energy balances has been pragmatic, using simple systems such as spreadsheets and straightforward, fill-in-the-blank templates— all based on building country-level capacity to verify and use the data.

**NDC Support Center supported the publication of reference documents, including the first Digest of Malawi Energy Statistics in January 2023.**

### 5.5 A Collaborative Approach and Cross-Sectoral Engagement

**Our approach takes an inter-ministerial and cross-sectoral approach to capacity building, recognizing the multi-dimensional nature of climate and energy transition planning.** Our training events are designed to enhance collaboration and coordination among different stakeholders – including university faculties, government ministries (such as the ministries of energy and environment), national statistical offices, electricity transmission and distribution companies, and other relevant organizations. By involving different stakeholders, we aim to ensure that knowledge is spread across relevant departments and sectors. This collaborative approach enables stakeholders to identify universal challenges and solutions – fostering a more coherent and unified effort in the design and implementation of climate and energy goals, including Nationally Determined Contributions (NDCs).

Through collaborative workflows and cross-sectoral engagement, we aim at maximizing the effectiveness and impact of capacity-building efforts, ultimately contributing to sustainable energy transitions in African countries. We also emphasize the importance of data communication and reporting to relevant bodies to enhance transparency and accountability in energy policy development and implementation.

**Mozambique's cross-sectoral engagement was highlighted by the participation of experts from the Ministry of Mineral Resources and Energy (MIREME), Eduardo Mondlane University, and the main power utility Electricity of Mozambique (EDM).**

### 5.6 A Tool-Agnostic Approach to Modeling Training

Our capacity-building approach is deliberately tool-agnostic, recognizing the diverse landscape of energy system and greenhouse gas accounting models. No single modeling framework can address all the challenges associated with designing and analyzing mitigation and transition pathways. By avoiding a narrow focus on specific tools, we avoid limiting participants to specific use cases and the need for constant retraining on new tools. **Instead, our approach emphasizes the development of a deep analytical understanding of energy system modeling principles.**

In the early stages of our training, we provide an overview of different families of energy system models. We also discuss the types of research questions they can address. This foundational knowledge allows participants to understand why and how energy system models are valuable tools for addressing complex challenges. Furthermore, given the lack of academic energy modeling capacity in many of the target regions, there is a risk that energy system modeling studies will continue to be predominantly conducted by foreign consultants, at least in the near future. To address this challenge, our training focuses on promoting a comprehensive understanding of existing research and studies on energy system modeling.

**Rather than focusing solely on model development, we prioritize equipping African policymakers and researchers with the analytical skills needed to critically evaluate outsourced work.** Our priority is to equip them with the skills to design and initiate scientifically sound projects. It is important for policymakers and researchers not only to design energy transition pathways, but also to understand and criticize externally conducted studies. This requires a holistic approach that goes beyond tool-oriented training. While training on specific tools remains critical for practical application in climate action planning, without a basic understanding of analytical principles, reliance on tools alone is risky.

In summary, our approach seeks to equip African Union Member States with the analytical knowledge and critical thinking skills necessary to navigate the complexities of energy system modeling. By prioritizing a holistic understanding over tool-specific training, we aim to build sustainable capacity that enables informed decision-making and effective energy transition planning.

**The tool-agnostic approach was made possible by VITO's extensive knowledge of energy modeling frameworks such as MARKAL TIMES, LEAP, and OSeMOSYS.**

### 5.7 A Tailor-Made Solution for each Country

Recognizing the unique challenges faced by each African Union Member State, we understand the importance of tailoring our capacity-building efforts to their specific needs and contexts. Rather than a one-size-fits-all approach, we believe in designing tailored solutions that address the different circumstances of each country (Figure 4).



Figure 4 – Example illustrating that each African Union Member State faces unique challenges which require tailored solutions.

**To meet this challenge, our support in each country begins with a situation analysis.** During this phase, we work closely with country focal points from various ministries to identify critical knowledge and data gaps. Through in-depth analysis, we aim to gain a comprehensive understanding of the country's specific challenges and needs.

In addition, our Situational Assessment includes a thorough review of past and existing support programs in the country. This analysis helps us to avoid duplication and ensures that our interventions are complementary to existing initiatives. By leveraging lessons learned, we aim to maximize the impact of our capacity-building efforts.

Based on the results of the Situational Assessment, we then work with country representatives to develop a National Action Plan (NAP).

This plan serves as a roadmap for the support provided, outlining clear objectives and strategies to address identified gaps. By involving country stakeholders in the development of this plan, we ensure alignment with national priorities and ownership of the capacity-building process.

Our approach prioritizes customization and collaboration to ensure that our capacity-building efforts effectively address the unique challenges each country faces. Through rigorous assessment and strategic planning, we aim to provide tailored solutions that enable countries to overcome obstacles and achieve their development goals.

**Energy statistics were emphasized in Malawi, while energy system modeling was examined in detail in Uganda and Mozambique. In addition, the NDC Support Center supported the development of a Green Hydrogen strategy in Morocco.**

# 6

## Energy System Modeling Training: An Advanced Curriculum

The NDC Support Center Pilot Program introduced an advanced curriculum designed to enhance participants’ understanding of the relevance of energy system modeling to policymaking. The training modules cover various aspects – from understanding modeling frameworks, to using data effectively, to formulating well-defined research questions. By equipping participants with comprehensive knowledge and skills, the various modules aim to empower African Union Member States to harness the potential of energy systems modeling for informed policy development and sustainable energy transitions.

### 6.1 Module 1: Recognizing the Relevance of Data in Energy System Modeling

Building on the capacity building to improve sector statistics, this module examines the specific data requirements of energy system models. It aims to streamline data communication workflows between various relevant bodies – such as the national statistics offices, transmission and distribution companies, and ministries.

MODULE #1	
Challenge	Low awareness of the relevance and importance of data in energy system modeling.
NDC SC Proposal	<ul style="list-style-type: none"> <li>&gt; Conduct practical hands-on sessions to understand how the data collected and compiled during the energy data and statistics training can be effectively used in energy system modeling exercises.</li> </ul>
Outcomes for Participants	<ul style="list-style-type: none"> <li>&gt; Learn how to improve collaboration and communication in data sharing processes.</li> <li>&gt; Gain strategies for overcoming existing challenges in day-to-day energy data and statistics tasks.</li> </ul>

### 6.2 Module 2: Defining Research and Policy Questions

In the journey of energy system modeling, clarity in defining research or policy questions serves as a fundamental step. Without clear definitions, the purpose and direction of energy system models become unclear – leading to flawed decisions in the selection of modeling features, tools, and scenario designs. This lack of clarity not only limits effective modeling exercises, but also hampers the screening and review of project proposals, especially when African policymakers seek external advice.

MODULE #2	
Challenge	Difficulty in formulating clear and precise research or policy questions.
NDC SC Proposal	<ul style="list-style-type: none"> <li>&gt; Guide the process of formulating and evaluating such questions, emphasizing the importance of matching them with available resources for thorough research and analysis.</li> <li>&gt; Facilitate discussions on the need to develop multiple research questions to frame relevant policy issues (an essential aspect of NDCs).</li> </ul>
Outcomes for Participants	<ul style="list-style-type: none"> <li>&gt; Gain insight into the intricacies of formulating well-defined research and policy questions.</li> <li>&gt; Develop the ability to guide energy system modeling exercises towards meaningful and impactful results.</li> </ul>

### 6.3 Module 3: Understanding the Relevance of Energy System Modeling for Policy Making

In many African contexts, energy system models are often perceived as complex mathematical tools primarily for researchers, with limited understanding of their practical application in policymaking. This perception creates a barrier between policymakers and researchers, hindering effective collaboration and use of energy system modeling to address pressing challenges.

MODULE #3	
Challenge	The complexity of energy system models and limited understanding of their practical application in policymaking.
NDC SC Proposal	<ul style="list-style-type: none"> <li>&gt; Facilitate dialogue between policymakers and researchers to demonstrate the real-world relevance of energy system models in policymaking through facilitated discussions and interactive exercises.</li> <li>&gt; Present real-world case studies from similar contexts to illustrate the practical application of energy system models in informing policy decisions.</li> <li>&gt; Integrate findings from the situational assessment report into the discussion to contextualize challenges and opportunities specific to the participants' contexts.</li> </ul>
Outcomes for Participants	Participants will gain a deeper understanding of the relevance of energy system models in addressing policy challenges.

### 6.4 Module 4: Identifying the Right Modeling Framework and Approach

Different challenges require tailored solutions, and no single energy system modeling framework can adequately address all these different challenges. Over the past decade, many African countries have been equipped with models and tools developed through support programs or consultancy work. However, due to their inability to address the specific challenges unique to each country, these tools are often outdated or underutilized.

MODULE #4	
Challenge	No single modeling framework can address all the challenges associated with designing and analyzing GHG mitigation pathways.
NDC SC Proposal	<ul style="list-style-type: none"> <li>&gt; Adopt a tool-agnostic approach that focuses on familiarizing participants with the features and characteristics of different families of energy system modeling frameworks</li> <li>&gt; Engage participants in discussions about different modeling choices: time horizon, time resolution, geographic representation and modeling approach<sup>3</sup>.</li> <li>&gt; Through guided exercises, help participants examine the challenges identified to determine which modeling tools are best suited for analyzing specific problems.</li> </ul>
Outcomes for Participants	<ul style="list-style-type: none"> <li>&gt; Develop a comprehensive understanding of the variety of energy system modeling frameworks available and their respective applications.</li> <li>&gt; Acquire the ability to select and apply the most appropriate modeling tools to address national challenges and improve the effectiveness of energy planning.</li> </ul>

<sup>3</sup> Bottom-up, top-down, hybrid, simulation, or optimization.



## 6.5 Module 5: Building Scenarios and Mitigation Options

In the context of NDCs, mitigation actions play a central role in the analysis of emission reduction potentials and the design of long-term strategies. This module of our training program focuses on understanding the essential elements of three key aspects: the business-as-usual (BAU) scenario, the definition of mitigation actions, and the building of scenarios to develop comprehensive strategies.

The importance of establishing a robust business-as-usual (BAU) scenario cannot be overstated, as it serves as the basis for evaluating potential emission reductions. However, the definition of this scenario is often overlooked in many African NDCs – highlighting the need for clarity and precision.

MODULE #5	
Challenge	Difficulty in building robust scenarios and understanding the consequences of using different approaches.
NDC SC Proposal	<ul style="list-style-type: none"> <li>&gt; Conduct hands-on sessions on mitigation and scenario modeling: participants will use their country's existing mitigation policies as outlined in their NDCs and implement them in simplified models built in Excel.</li> <li>&gt; Facilitate guided discussions on the relevance of scenario designs and the importance of aligning them with a country's pathways to achieve its targets.</li> </ul>
Outcomes for Participants	<ul style="list-style-type: none"> <li>&gt; Gain insight into the inputs required to translate mitigation actions into the language of the model, as well as the typical assumptions and simplifications inherent in modeling exercises.</li> <li>&gt; Learn to document the assumptions and data used to model mitigation actions in the form of modeling factsheets or assumption books, which encourages critical and analytical thinking.</li> <li>&gt; Develop the ability to effectively communicate assumptions and model results, particularly in cases involving external consultants.</li> </ul>

## 6.6 Module 6: Off-Model Analysis

In this module, participants will use modeling results of countries' mitigation actions to extract meaningful insights and indicators from energy system modeling results that go beyond traditional analyses such as energy mix and cost.

MODULE #6	
Challenge	Difficulty in obtaining meaningful results and identifying relevant indicators and in-depth analysis of the model output
NDC SC Proposal	<ul style="list-style-type: none"> <li>&gt; Conduct hands-on exercises and analytical discussions on the feasibility and implementation priorities of mitigation actions.</li> <li>&gt; Facilitate discussions on additional tools such as Marginal Abatement Cost Curves, priority analysis matrices, risk analysis, etc.</li> </ul>
Outcomes for Participants	<ul style="list-style-type: none"> <li>&gt; Develop indicators directly related to the research or policy question underlying the proposed mitigation actions.</li> <li>&gt; Acquire skills necessary to translate modeling outputs into actionable insights and strategies.</li> </ul>

## 6.7 Module 7: Energy Models Reporting Practices

In the final module of the energy system modeling training, participants will explore best practices for reporting to ensure clear and transparent communication of the results and insights derived from modeling exercises. Emphasis is placed on developing effective visualization routines and creating results fact sheets that accurately convey key findings and policy implications of the mitigation measures.

MODULE #7	
Challenge	Difficulty in effectively communicating and disseminating complex model results into understandable and concrete reports for a wide range of audiences, from policymakers to researchers.
NDC SC Proposal	<ul style="list-style-type: none"> <li>&gt; Facilitate guided discussions on different methods for disseminating results to stakeholders, including policymakers, government agencies, and the public.</li> </ul>
Outcomes for Participants	<ul style="list-style-type: none"> <li>&gt; Learn how to effectively communicate policy insights derived from the modeling exercises.</li> <li>&gt; Develop the ability to communicate complex modeling results in a way that is accessible and actionable to diverse audiences.</li> </ul>

In the context of sustainable energy transitions and climate change mitigation, this training program will ensure that energy system modeling insights are effectively used for informed policy development and decision-making.

# 7

## The NDC Support Center Pilot Program: The Case of Malawi

While our work has been evaluated successfully in all four partner countries, our work in Malawi has proven to be the most progressive. There, the NDC Support Center actively supported stakeholders at all levels in developing climate and energy policies: from developing the first digest of the Malawi Energy Statistics to equipping them with the critical analytical skills needed for effective modeling and GHG emissions accounting, with a specific focus on the NDCs.

### 7.1 Some Background

Malawi is a landlocked country in sub-Saharan Africa with a dense and growing population that relies heavily on fuelwood, which accounts for 85% of the country's total primary energy supply. However, access to electricity in Malawi remains one of the lowest in sub-Saharan Africa, with only about 20% of the population having access.

### 7.2 Exploring Malawi's Energy Landscape

Malawi has experienced severe climate change impacts in recent years, including rising temperatures and an increasing number of climate-related events. Despite its high vulnerability to climate impacts, Malawi's greenhouse gas emissions are currently among the lowest in the world, both in absolute terms and per capita. However, projections indicate that emissions are expected to increase due to population growth, economic development, the achievement of universal energy access targets, and rapid urbanization in the country.

### 7.3 NDC Commitments and Capacity Challenges

Malawi has demonstrated its commitment to climate action by submitting its first Intended Nationally Determined Contribution (INDC) in 2015, followed by its first NDC in 2017 and an updated version in 2021. The updated NDC sets ambitious targets – including a 6% reduction in greenhouse gas emissions from business-as-usual (BAU) levels by 2040, with the potential for further reductions depending on international support and financing.

Despite these efforts, Malawi faces significant challenges in implementing its NDC due to a lack of capacity and expertise.

Country focal points have highlighted the need for improved energy data and energy planning knowledge to accurately assess the feasibility and robustness of proposed mitigation actions.

### 7.4 Contributions of the NDC Support Center

#### Phase 1: Situational assessment report

The NDC Support Center Pilot Program began its activities in Malawi in 2021 with the establishment of focal points within the Ministry of Energy and the Ministry of Natural Resources and Climate Change, facilitated by the African Union Energy Commission (AFREC). The primary objective was to develop a situational assessment report for the country.

The assessment revealed that Malawi currently lacks comprehensive energy statistics and an energy balance, which poses significant challenges in quantifying the country's energy system. Discussions with the country's focal points further highlighted the nascent stage of energy statistics in Malawi. While the Ministry of Energy oversees all fuels, the development of energy statistics required coordination with other ministries and stakeholders, including the Ministry of Mining, the Ministry of Trade, the Ministry of Environment, the National Statistics Institute (NSI), the Energy Regulatory Authority (MERA), and energy companies. As a result, the main challenges identified included resource constraints, budget limitations, staffing issues, difficulties in obtaining data from businesses, and a lack of broader support, including political support for energy statistics.

In terms of energy system and GHG emissions accounting, Malawi relies heavily on external consultancy support to provide emissions inventories, without clear scientific modeling conducted to assess the potential of mitigation policies and their associated cost analysis. The lack of capacity to understand the existing models and tools developed through the NDC consulting work has been identified as a significant barrier to the sustainable use of such tools for future NDC stocktaking in the country.

### Phase 2: Improving energy data and statistics

With the assistance of an expert energy statistician, Malawi embarked on a two-year program that resulted in the production of statistics on energy production and use, an energy balance, energy prices and the first Digest of Malawi Energy Statistics.

The work involved:

- > Dedicated expert support.
- > Discussions with stakeholders to gain a commitment from all.
- > Building an understanding of needs and roles.
- > Hands-on training and learning by doing for all stakeholders through one online and two in-country hands-on training events.
- > Knowledge sharing on energy statistics, estimation, data validation and data procurement (AFREC questionnaires).
- > Alignment with the African Energy Information System (AEIS) developed by AFREC.

- > Demonstrating the use of existing data from the statistical office and other Ministries, Departments, and Agencies (MDAs).
- > Building a simple spreadsheet system, data collection templates and knowledge sharing.
- > Planning and implementing a meaningful plan for data dissemination and promotion of statistics.

A key element of the work was to build cooperation among all the ministries involved, the statistical office, regulators, and businesses. However, such collaborative efforts take time, and the long-term nature of the NDC Support Center has been critical to its success.

Table 1 below shows the evolution of the work in Malawi – demonstrating increased engagement and transfer of skills and knowledge year on year.

	2021	2022 (YEAR 1 OF SUPPORT)	2023 (YEAR 2 OF SUPPORT)
Energy balances produced	None	2020	2021 and started 2022
Produced by	N/A	Expert	Malawi (Ministry of Energy), assisted by expert
Engagement of other MDAs and business (measured by data templates provided)	-	3 templates	5 templates

Table 1 - Evolution of NDC Support Center in Malawi

Support to Malawi also recognized the importance of making energy statistics accessible to all. To achieve this, a key output was the development of a Digest of Malawi Energy Statistics – covering energy balances, key data on all fuels, energy prices and electricity capacity. It also showed the methodology used and how the data could be improved in future years.

This report was published by the Ministry of Energy in April 2023, providing tangible evidence of how the NDC Support Center has made a difference.

Malawi is on track to produce its own energy statistics on a regular basis, but continued support is needed. Progress is well underway, with a steady increase in knowledge and commitment from all stakeholders.



### **Phase 3: Strengthening energy system and GHG accounting modeling capacity**

The Malawi Pilot Program was structured into four phases of hybrid workshops conducted over a two-year period. This comprehensive initiative included 200 hours of online sessions and 60 hours of in-country workshops for a selected group of 15 experts from key institutions – including the Ministry of Energy, the Ministry of Natural Resources and Climate Change, and the Malawi University of Business and Applied Science (MUBAS).

These experts – who were also trained during the energy statistics phase – underwent a rigorous capacity building program aimed at equipping them with critical analytical skills necessary for effective modeling and GHG emissions accounting, with a specific focus on NDCs. Over the course of two years, participants were exposed to various topics essential for competent modeling work – including energy system model database management, data validation, verification, and quality control.

They also learned how to select appropriate modeling tools, design demand projections, and evaluate mitigation strategies in terms of both potential impacts and estimated costs.

Participants also gained insights into overseeing potential outsourcing of NDC modeling tasks, enabling them to verify the deliverables of consultancy work and ensure the robustness of modeling results. This included guiding energy system modeling exercises to be more closely aligned with local needs and realities, thereby increasing the relevance and applicability of the studies conducted.

Overall, the NDC Support Center Pilot Program has succeeded in empowering Malawian experts to take a leading role in advancing the country's NDC implementation efforts and promoting sustainable development in the face of climate change challenges.

# 8

## Conclusion

African countries are making rapid progress in contributing to global climate neutrality while pursuing sustainable growth.

However, they still face many challenges that will require substantial support to achieve their ambitious economic and environmental goals. Indeed, the transformation they seek requires sound, long-term planning, and a solid knowledge base. And while educational reforms are underway, progress is not always able to keep pace with the rapid changes required. This calls for additional support from the global community.

Against this backdrop, our NDC Support Center Pilot Program has focused on building the capacity needed for climate goal planning. Over the past three years, we have identified the evolving needs of four African countries to achieve their ambitious targets through improved planning.

Throughout this White Paper, we have identified key challenges that could hinder the effectiveness of current global support. This analysis has led us to redefine the traditional paradigm of capacity building, recommending:

### Long-Term Support

We emphasize long-term, continuous support over the course of three to five years – empowering participants with practical expertise and a learning-by-doing approach, enabling them to tackle challenges with confidence and develop practical solutions.

### Co-Creation

Rather than simply disseminating knowledge, our approach focuses on co-creation, where participants actively shape capacity-building activities, fostering ownership and collective responsibility for advancing climate action agendas.

### Energy Data and Statistics

We believe that capacity building in energy data is critical for informed decision-making, and we prioritize training in long-term sustainable data collection, management, and analysis to enable evidence-based policy design and decision-making.

### Cross-Sectoral Engagement

With a cross-ministerial and sectoral perspective, we foster collaboration to improve climate and energy transition planning and maximize the impact of capacity-building efforts.

### Tool-Agnostic Training

Our approach avoids a narrow focus on specific tools, instead emphasizing the deep analytical understanding and skills necessary for informed decision-making and effective energy transition planning.

### Tailored Solutions

We recognize unique challenges and tailor solutions through a Situational Assessment Phase – working closely with country focal points to develop National Action Plans aligned with national priorities.

All of the above has resulted in the NDC Support Center Pilot Program having a tangible impact on the maturity and capacity of our participating partner countries, which they have shared at various conferences and publicly affirmed at the last two Conferences of Parties in Sharm-al-Sheikh (COP27) and Dubai (COP28).

Rashid Ali Abdallah, Executive Director of AFREC, underlined the importance of these achievements:

*“The results obtained in the implementation of this Pilot Program are very encouraging, in particular the commitment of the countries at the highest level by the responsible ministers and the involvement of the various actors involved in the energy sector. The NDC Support Center facilitates the coordination of national efforts, strengthens country capacities, and promotes the sharing of knowledge and best practices.”*

However, these encouraging results do not mean that all barriers have been overcome. Full independence in the development and communication of climate planning objectives at the global level remains a challenge and will require continued support to consolidate the foundations laid by the NDC Support Center Pilot Program.

Indeed, significant institutional capacity gaps remain – particularly in energy data and statistics – that require our continued attention: active participation in modeling and policy development is essential for countries to effectively address climate challenges.

This is why the NDC Support Center aims to extend its activities.

We want to ensure sustainable support for the knowledge and capacity provided to these countries and aim to expand our capacity-building curriculum for participating countries – focusing on filling existing gaps and further strengthening their capabilities. In addition, the lessons learned and frameworks developed have the potential for wider application in similar contexts across the developing world, providing opportunities for replication and expansion to benefit more countries facing similar challenges.

The NDC Support Center Pilot Program has a proven track record of establishing improved governance processes for NDC reporting under the Paris Agreement’s collective commitment to net zero. Reflecting on this success, Rashid Ali Abdallah, Executive Director of AFREC, emphasized:

***“In view of the results of the NDC Support Center, AFREC and VITO are committed to pooling their efforts to mobilize more resources with a view to extending support to all Member States of the African Union.”***

Indeed, building on this solid foundation is essential if we are to continue to make impactful progress. And this is not just a mission - it is a commitment we intend to uphold.

